Project Title: Career Development for STEM Professionals

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Executive Summary

The overall aim of this project was to develop a sustainable framework for supporting students into STEM employment, focusing on careers advice and professional development for those who are seeking to enter, return to or progress their careers in this sector. A specific objective was to ensure that the Open University continues its highly successful and visible role in supporting women returning to STEM after a career break.

The starting point for the project was to evaluate and learn from the post-course experience of participants on the T160 and T161 Return to SET courses which ran from 2005 to 2011. Evidence from an evaluation in 2007 (Dale et al 2007) indicated high value for returners and large numbers of positive outcomes, but also revealed that there were likely to be many different points at which 'returners' move in and out of the labour market (Herman and Webster 2010).

Project activities included a survey of students 5 years after completion of the T160 module; in-depth career-biographical interviews; a practitioner focus group; and the development of a prototype animated careers guidance resource – the Racetrack.

Survey data indicated that over 70% of the respondents had found employment mostly in STEM related occupations. About half of these had 'rebooted', returning to their professions, while the remainder had 'rerouted' or changed career. Key findings included the identification of five on-ramping strategies(getting a foot in the door, networking, retraining, intermediary agency support and self-demotion) which had enabled the women to return to either full time or part time work. There were three main aspects of the T160 course which were particularly helpful in developing employability. Firstly, 'identity work' which involved building and improving CVs; secondly, peer support and sense of community which resulted in reduced isolation and increased confidence; and finally the provision of a structured and assessed PDP pathway starting with reflection and culminating in goal setting and an action plan.

Specific recommendations for supporting students back into STEM employment include:

(a) CV support should include guided development and structured feedback

(b) Provision for women returners should include community building and peer support

(c) PDP for mature students can best be achieved using a structured yet flexible pathway that takes into account differing lifecourse experiences

(d) employability interventions need to take account of structural inequalities

(e) networking should be actively promoted as a strategy.

The project has linked closely to the OU's Employability strategy and worked in partnership with the Careers and Employability Project. As a result of the project, we have now begun to embed employability resources and activities within new modules, and are looking to ways to commercialise the Racetrack animation for a wider audience possibly via Open Learn.

1. Aims and scope of the project

1.1 Aims and scope

The overall aim of this project was to develop a sustainable framework for supporting students into STEM employment, focusing on careers advice and professional development for those who are seeking to enter, return to or progress their careers in this sector. A specific objective was to ensure that the Open University continues its highly successful and visible role in supporting women returning to STEM after a career break. We aimed to create this model on robust evidence gathered from participants on the T160 and T161 Return to SET courses and to seek ways to broaden this out to a wider target group.

1.2 Specific goals

- evaluate the long term outcomes in terms of employability and career progression for students who participated on the T160 and T161 courses between 2005 and 2011
- investigate ways to reuse and deliver the T161 module materials after the final presentation in 2011J
- establish a sustainable model for delivery of PDP and career development which would meet the needs of students and professionals who are seeking to build and develop careers in STEM

2. Activities

2.1 Overall approach

The main focus of the project was to carry out a research study that would assess the outcomes and evaluate the impact of T160 for participants, 5 years after completion of the module. We also identified the need to work in partnership with the OU Careers Service, to apply learning from the findings of the research into the implementation of the OU's Employability strategy. At a practical level we planned to develop a media resource that could be used to continue support for women returners to STEM after the final presentation of T161.

2.2 Planned activities

- Collect data from T160 alumni via a survey and interviews
- Consult with UKRC careers advisors who had been part of the network of support for T160 students
- Create a video resource/ animation
- Engage in discussions with the OU Careers Service regarding re-use of T161 course materials and employability strategy

2.3 Changes to original project plan

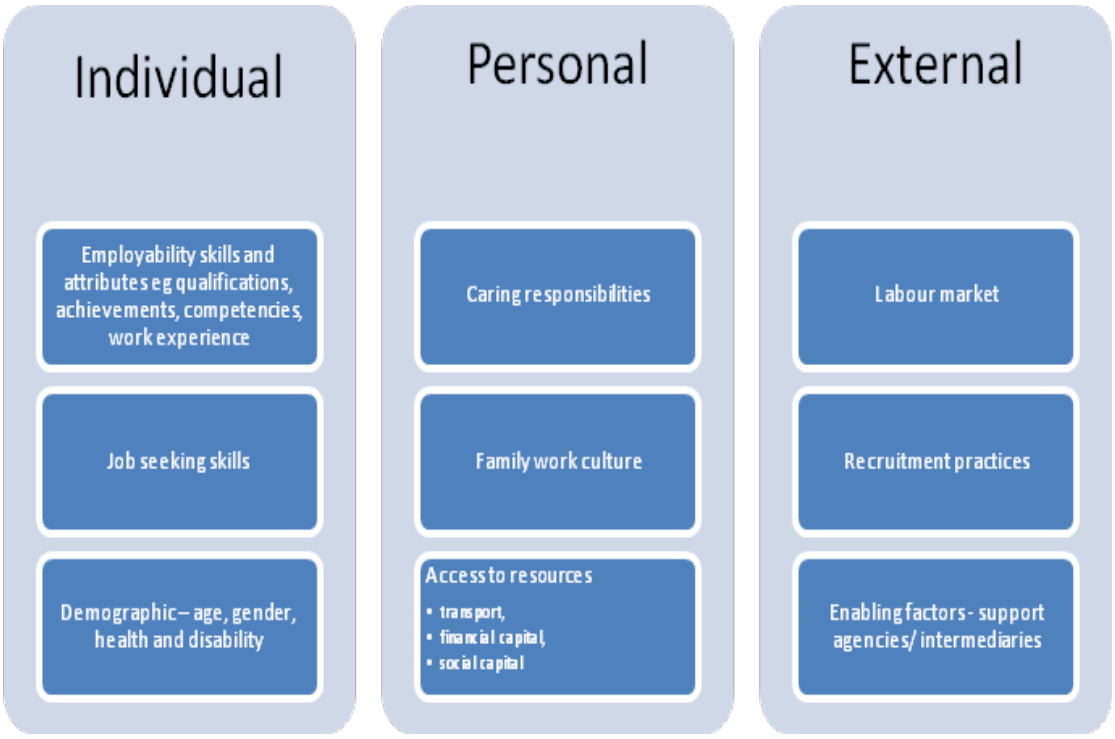
We had originally planned to make a video but when we investigated costings it became clear that to do this properly was beyond the project budget, so we decided to create an animation based resource instead based on a racetrack metaphor. The development work for this was undertaken by an external consultant although initial design and specification was provided by the project team. The prototype was able to incorporate many of the activities and resources that had been part of the T161 module, and was designed to be easily adaptable to different requirements depending on curriculum area and student profile. However the Racetrack animation still remains in its prototype stage and is therefore only available for demonstration purposes rather than for full use by students. Thus it only partially meets the original objective of identifying a way to re-use the T161 materials.

2.4 Data and evidence gathered

- Survey. An invitation to complete a postal survey was sent to 167 women who had been participants on the T160 course in 2005 and 2006. They had all been part of an original evaluation study conducted after completion of the module, and had agreed to be consulted as part of a longitudinal study about their outcomes and career progression. 66 of them responded to the survey, indicating their current employment status and some giving additional comments.

- Practitioner focus group – this was conducted with a group of advisors who had been part of the network of ongoing support for women who had participated in T160 and T161. (The module had been developed in partnership with a national network of organisations headed by the UK Resource Centre for Women in SET (UKRC)[1] that had regional workers who were in contact with students following the course and provided networking events, mentoring and other employability enhancing services.)Five advisors took part in the focus group held in Birmingham. The converstation was recorded and transcribed, providing valuable background data about the strategy and services offered by the UKRC to the women following the T160 course, which informed the analysis and interviews.

- Interviews. One third (23) of the survey respondents were interviewed by telephone using a semi structured interview schedule, that covered their career biographies since completion of the module. The first set of interviews were with 12 of these women who had returned to work in a STEM occupation either full time or part time. The interviews explored the factors that had influenced their 'successful' return to a STEM job, including the role of the T160 course in these transitions.



[1] The UK Resource Centre for Women in SET or UKRC was the lead partner in a consortium (in which the Open University was a partner) that was funded by the UK government between 2004 and 2011 to support women in SET. It is now known as WISE http://www.wisecampaign.org.uk

Fig 1 Three dimensions of Employability - adapted from McQuaid and Lyndsay (2005)

- Analysis – a coding framework was developed using a subset of McQuaid and Lyndsay's Employability framework criteria (2005) which segmented employability characteristics into Individual, Personal and External factors. A second group of interviews were then carried out with women who were either not in work or were working in non STEM jobs, using an adapted interview schedule that had been modified in the light of the findings from the first set of interview data. These were then coded and compared with the first group.

3. Findings

There were 66 respondents to the survey (a 40% response rate). The survey asked them to indicate their current employment status, choosing from a range of predefined outcomes. They were also invited to make qualitative comments that gave more details of their work since participating in the course. Table 1 shows the distribution of outcomes

Outcome	No of respondents	%
Working	***47***	***71***
In STEM (full or part time)	39	59
Not in STEM (full or part time)	8	12
Not working	***19***	***29***
Caring full time	9	11
Full time study	4	6
Unemployed looking for work	4	6
Not in work/not looking for work	4	6
TOTAL	**66**	**100**

Table 1: Employment outcomes for women returners 5 years after completing T160

The survey results indicated that over 70% of women were now working, the majority in a STEM occupation. Of those who were now in work, about half had changed careers (Re-routing) and the remainder had returned to their original professions (Re-booting). Only 4 of the respondents were actively seeking work 5 years after completing the T160 module.

Qualitative comments and interviews revealed that transitions had not been straight forwardly linear, reiterating earlier findings that women who leave STEM professions tend to move in and out of the labour market and often do not follow a linear career route (Herman and Webster 2010). Some had returned to work and then left again, other had tried to change careers but not succeeded so returned to their original occupations. Half of those who returned to work had changed careers, often moving into sectors that were considered to be more compatible with combining family care and career (such as education and health). Nevertheless, the majority of these were still in STEM related occupations.

The barriers women face returning to STEM have already been well documented (see Herman and Webster 2010) and the interview data from this study reiterated a similar set of individual, personal and external factors. The narratives revealed that many had faced barriers related to gendered cultures within SET industries and heteronormative assumptions (their own as well as those of family members and employers) about domestic divisions of labour especially childcare that affected their availability for work. However there were some

exceptions where the redundancy of a male partner had enabled/ driven women to accelerate their own careers. For some women, additional barriers exacerbated their difficulties in returning to STEM – these included disability, ill health (their own or that of their children), and age discrimination. It is important that the intersection of barriers is recognised.

3.1 On ramping strategies

While individual stories of return varied enormously, the data revealed a number of common experiences, especially in the strategies that had been used to gain employment. The goal for women participating in the course had been getting back into STEM related work, and so it was particularly interesting to analyse what had helped those who had achieved successful 'on-ramping' (Hewlett 2007). Five main strategies emerged from the narratives:

- Getting a foot in the door – this included volunteering, carrying out unpaid work, or working in a non SET role within an organisation which was perceived to have been instrumental in the transition to their current employment. For example one woman had worked in a non professional role (as a temporary administrator) and had then found out about and secured a STEM job within the same organisation by looking at their (staff only) vacancy lists.

- Networking– several women gave examples of having found jobs, which had not been publicly advertised, via contacts and people they knew (either friends and family or otherwise via previous professional contacts)

- Retraining – about half of those who had found jobs had undertaken further subject specific retraining. For some this took the form of upskilling in their previous occupational sector (such as one woman who had been a mainframe programmer but then retrained to do Java programming) while for others there was a total change of career (albeit usually still STEM related)

- Intermediary agency support – this category included accessing agencies or funding resources specifically for women returners to support their transition into employment. For example two women who were aiming to return to their academic research careers, obtained Daphne Jackson Trust fellowships[2] that had enabled them to make a successful transition back to academia. Others were supported into work placements with the help of the UKRC, and others had attended training or further study with the help of bursaries from Equalitec[3]. All of these had been explicitly signposted within the T160 course materials.

- Self-demotion – this entailed a trade off ie working in a lower status job often at low rates of pay, in return for flexibility and proximity to home. There were several examples of women who had become teaching assistants or school science technicians who explicitly talked about how this was a trade off strategy which they hoped was temporary until their children were older.

3.2 Impact of the T160 Module on employability

Understanding the impact of the T160 module was one of the core objectives of the project in order to be able to identify good practice that might be taken forward into the

[2] The Daphne Jackson trust offers 2 year part time paid fellowships for SET researchers who are returning after a career break. For more details see http://www.daphnejackson.org/

[3] Equalitec was a European funded project to support women into IT http://www.equalitec.org.uk/

implementation of the OUs Employability strategy within STEM curriculum areas. Making a causal link between the course and current employment status would of necessity be rather tenuous, so the focus of questioning and analysis was on their subjective interpretation of their experience on the course and the long term impact that they felt it had had for them. Thus this section of the interview began by asking what was remembered about T160, and was left intentionally open ended rather than probing for specific topics. Since this was a short module that had been taken five years earlier, the assumption was that interviewees would not remember a lot about the content, but the question aimed to ascertain what if anything had retained long term value for them.

By far the most frequent and significant feature that was spoken about was the set of activities that facilitated '**identity work**' (Smith 2010), which in the case of this course was centred around the articulation and presentation of skills and achievements through a CV. Many of the women had not written a CV for many years and talked about how the process of constructing a CV had been transformative for them, as well as providing them with a vital tool for presenting themselves to prospective employers.

From the second week of the module onwards, students were led through a set of structured activities in which they gathered relevant details about their educational and employment achievements and prepared a CV. This was done in the initial version of the module using the OU's prototype stand alone PDP tool called Profile[4] which was then replaced with MyStuff in the revised T161 module. A related factor which was prominent in the interview data was the role of the tutor in providing feedback on their CV. In the original version of theT160 module, students submitted a draft of their CV in the TMA which was then commented on by their tutor in quite considerable detail, and this was then resubmitted in the ECA (as it was then called). In later iterations of the module, when it had moved to a moderator-only format, with an EMA but no TMA, the students still received substantial individualised feedback about their CV from the EMA markers.

The positive experience of **peer support and community**, often described as 'being in the same boat', was a second very prominent theme that emerged from the interviews as a lasting impression of the course . This approach had been intentionally embedded in the design of the course and included group based and peer activities within online forums, as well as meeting face to face in tutorials and networking events organised by the partner agencies in different regions. As well as experiencing this in practice, students carried out a number of learning activities around the theme of networking and were encouraged to use this as a job seeking strategy. Indeed, as seen in Section 3.1, this did in fact prove to be a significant and effective factor in several of the successful outcomes.

Another group of responses was focused around the value of the **structured PDP** activities that permeated the whole course. These were reflective activities starting with a restrospective 'lifeline' and culminating in a forward looking vision statement, that enabled students to articulate their re-orientation towards a career in STEM, and included the identification of a personal pathway for returning to work in the form of an action plan (both of which formed part of the final assessment in the ECA).

Further evidence and more detailed discussion about these findings are available in the papers indicated below in Section 5 (List of Deliverables)

[4] For details of the use of this ePortfolio for PDP see an earlier paper (Herman & Kirkup 2008)

3.3 Implications for future support for women returners at the OU

The final presentation of the T161 Return to SET module was completed in 2011, and since then there has been no specific provision available at the OU for women seeking to return to work in these sectors. The findings from this project are useful in helping to inform what strategies we should be offering women returners to STEM in future. With employability high on the agenda for all HEIs in the UK, and the OU working to implement PDP for all Level 1 students, these findings are also valuable for the university as a whole. Specific recommendations include:

- CV support should include guided development and structured feedback
  While advice and guidance about how to build an effective CV are useful, the evidence from this study shows that it was the feedback and improvement loop that was most valuable to students in ensuring their CV was an effective employability tool. Moreover it was the process of reflection and CV building itself that enabled a reframing of identity and the articulation of aspirations.

- Provision for women returners should include community building and peer support
  Women returners are often in a position of low self esteem and reduced professional confidence, and benefit from exploring their concerns and developing solutions within a group context, where they no longer experience a sense of isolation. This shared experience can be effectively supported using online tools and environments, and can also benefit from face to face meetings and tutorials.

- PDP can best be achieved using a structured yet flexible pathway
  The diverse range of experiences and 'work readiness' of women returners to STEM means that a generic framework works well, enabling a 'pick and mix' approach to activities. The racetrack model which was developed in this project offers flexibility and can be adapted to individual needs, but this would need further development if it is to be offered to registered students or open learners. However this type of iterative model could present a useful format for the OU to take forward in implementing our institution wide PDP strategy.

- Employability strategy need to take account of diversity and unequal opportunities
  The OU needs to be aware of gender and other factors affecting employment opportunities, in the way in which we embed employability into our student experience. Constraints that shape and influence the work prospects of our students do exist and we should ensure that we address these rather than assume a level playing field, while at the same time raising aspirations and motivation for all our students.

- Promote networking as a job seeking strategy
  Using networks and contacts in successfully returning to work should be highlighted as an important strategy and we should encourage this in our approach to employability, alongside more traditional job seeking skills. Building effective links between current students and OU alumni might be a strategy that could help those without many existing contacts.

4. Impact

4.1 Student experience

Impacted on student learning

As the project was concerned with the evaluation of a module that is no longer being presented, there has been no specific impact on student learning, other than raising the issue of employability within in the teaching of STEM among other stakeholders.

Contribution to increasing student employabilty

During the dissemination of the project outcomes and via subsequent discussions with the Careers and Employability Project, the lessons and broader objectives of the project have been incorprated into ongoing discussion and development of the Employability Strategy of the OU in general and the STEM faculties in particular. Specific examples of how the project has contributed to the development of employability opportunities for students (who were not included in the project) include:

- Employment related activities from T161 are being included within the new TM129 End of Module Assessment
- The T161 Visiting Experts activity is being taken forward into a new STEM Ambassadors project being developed in partnership with STEMNET and the OU Careers Service (and the subject of a new eSTEeM project in conjunction with Nigel Mason from Science)
- The transfer of learning about using ePortfolios which is being implemented in TM129

4.2 Teaching

Effect on the practice of both yourself and others within the OU

In terms of practice, it was never the intention of this project to have a direct application on teaching, but it is reasonable to suggest that the conversations and dissemination activities have raised the profile of the needs of women returners to STEM across many areas of the OU that had not previously been aware of these issues.

Impact of the project outside the OU

We have had interest from several potential partners regarding the possible use of the animation tool, for example from the Women in Materials Steering Group (part of the IMMM), from a potential international partner VHTO (the Dutch expert organisation for girls and women in STEM)and from the Scottish Resource Centre for Women in SET who are developing a career development programme for women in STEM.

As a dissemination event for this project, the Gender, STEM and Employability seminar was held at the Open Unviersity in London in November 2012 and brought together practitioners and educators from a range of organisations from across the UK who are working in similar areas, namely in supporting women to enter, advance in or return to STEM careers and a presentation of the outcomes from this project received considerable interest. Discussions are still ongoing about possible collaborative projects to follow this.

4.3 Strategic change and learning design

Impact on the University's policies and practices.

Since completing the project, I have been closely involved in the university wide Careers and Employability Project and been able to transfer and share learning from this eSTEeM project to the team who have been developing a new careers strategy and into new initiatives such as the PDP framework and ePortfolios development.

I am also now leading on the implementation of MCTs Employability strategy across all programmes and qualifications at both undergraduate and postgraduate levels.

5. List of deliverables

5.1. Resources

Racetrack animation http://users.mct.open.ac.uk/kc2645/1.0.3/

5.2. Conference presentations and posters:

a) Herman C. *Returning to another place? Boundary crossing and career transitions among women science, engineering and technology professionals re-entering employment.* Paper presented at **Gender Work and Organisation** Conference Keele University, 27-29 June 2012 – available at http://oro.open.ac.uk/id/eprint/36328

b) Herman C., Whitelegg E., Kirkup G., and Chicot K., *Distance travelled: supporting women returning to STEM careers*. Poster presented for **HEA STEM Annual Conference**, Imperial College London 12-13 April 2012 available at http://oro.open.ac.uk/id/eprint/36330

c) Herman, C. *Returning to SET: reflections on an online module*. Poster presentation at **European Gender Summit: Quality Research and Innovation Through Equality**, 8-9 November 2011, Brussels – available at http://oro.open.ac.uk/id/eprint/30273

d) Herman C., Chicot K., Lewis A., Whitelegg E., Kirkup G**.** *Employability and STEM: Narratives of Returning to Professional Lives* **eSTEeM Community Workshop**, Open University, Milton Keynes, November 2011

e) Herman C., Chicot K.,, Lewis A., Whitelegg E., Kirkup G. *Enhancing employability in STEM: Long term outcomes from the T160 Return to SET course,* **eSTEeM Annual Conference**, Open University, Milton Keynes, March 2012

f) Herman C. *Virtual Employability: Using Distance Learning with Women Returners to STEM* at **Crossing Boundaries: Gender STEM and Employability Reconsidered** Seminar at the Open University in London, 22 Nov 2012

g) Herman, C. *Return to Science Engineering and Technology: Impact and outcomes*, invited talk at **VHTO** (Dutch national expert on women and girls in Science and Technology), Amsterdam, 21st January 2013

h) Herman, C. *Enhancing Employability in STEM: Learning from the T160 experience* at **eLearning Community event**, Open University, Milton Keynes, 16th Feb 2013

5.3. Forthcoming publications:

- Paper **Rebooting or rerouting: mid-career transitions of women returning to science, engineering and technology** has been submitted to the Journal of Vocational Behaviour and is under review
- Paper **Returning to STEM: Gendered factors affecting employability for women after career breaks** is near completion
- Conference review of the Gender STEM and Employability Seminar is planned for publication in March 2013.

6. Figures and tables

Table 1: Employment outcomes for women returners 5 years after completing T160
Fig 1: Three dimensions of Employability - adapted from McQuaid and Lyndsay (2005)

7. References

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